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# Power Supply and Bus Systems

**Model: E38, E39 and E53**

**Production: Start of Production**

# OBJECTIVES

After completion of this module you will be able to:

- Understand Bus System Configuration
- Understand Power Supply
- Locate and Identify Fuse Locations

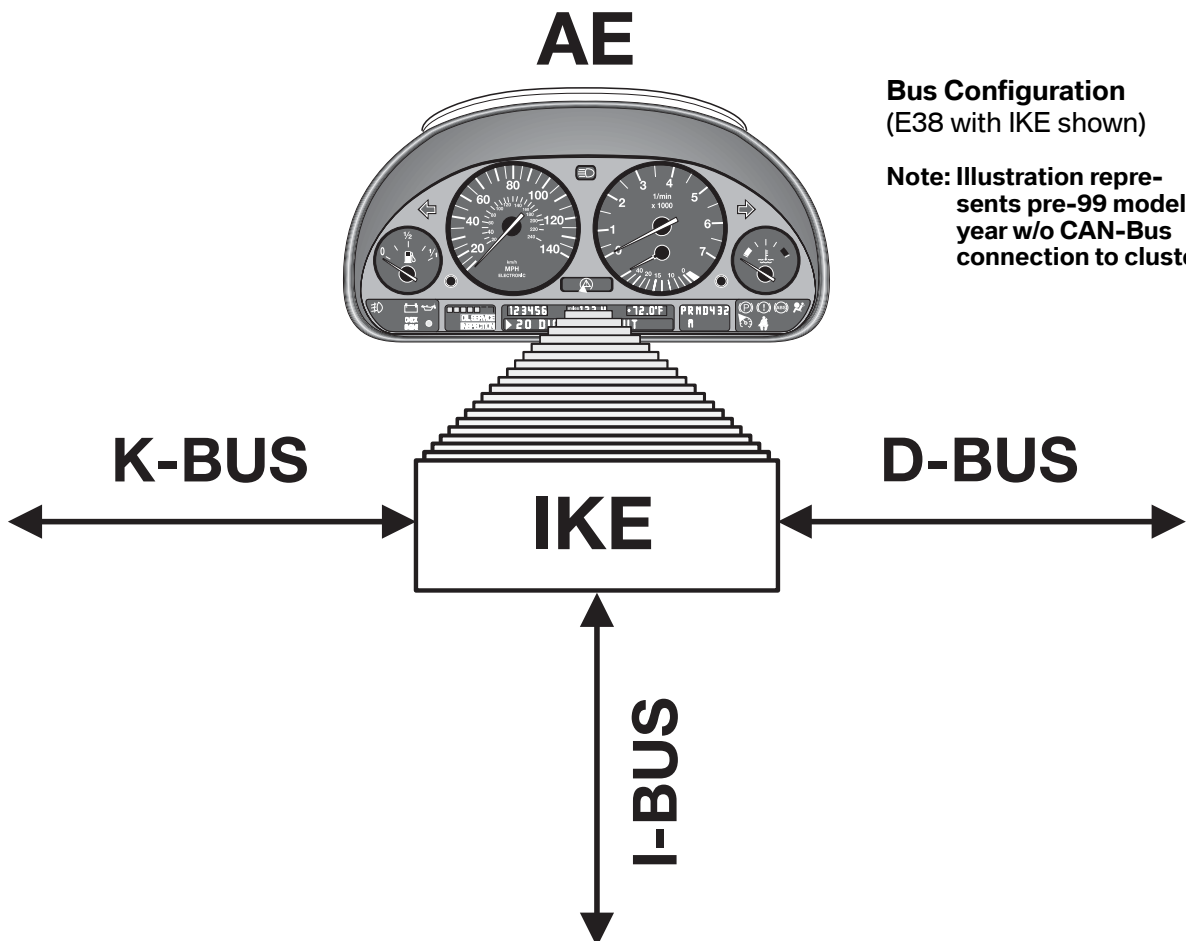
## Bus Systems

The introduction of the E38 marked the first large scale usage of bus networks on BMW vehicles. For the first time bus networks are used to reduce overall wiring requirements due to the expanding vehicle systems and increased functionality.

The models subsequent to the E38, such as the E39 and E53 use a similar bus structure. The only difference in these vehicles is the use of the I-Bus which is mostly dependent upon model year, vehicle equipment levels and options.

These vehicle use the following bus networks:

- Information Bus (I-Bus)
- Body Bus (K-Bus)
- Peripheral Bus (P-Bus)
- Motor Bus (M-Bus)
- Diagnosis Bus (D-Bus)
- Controller Area Network (CAN-Bus)



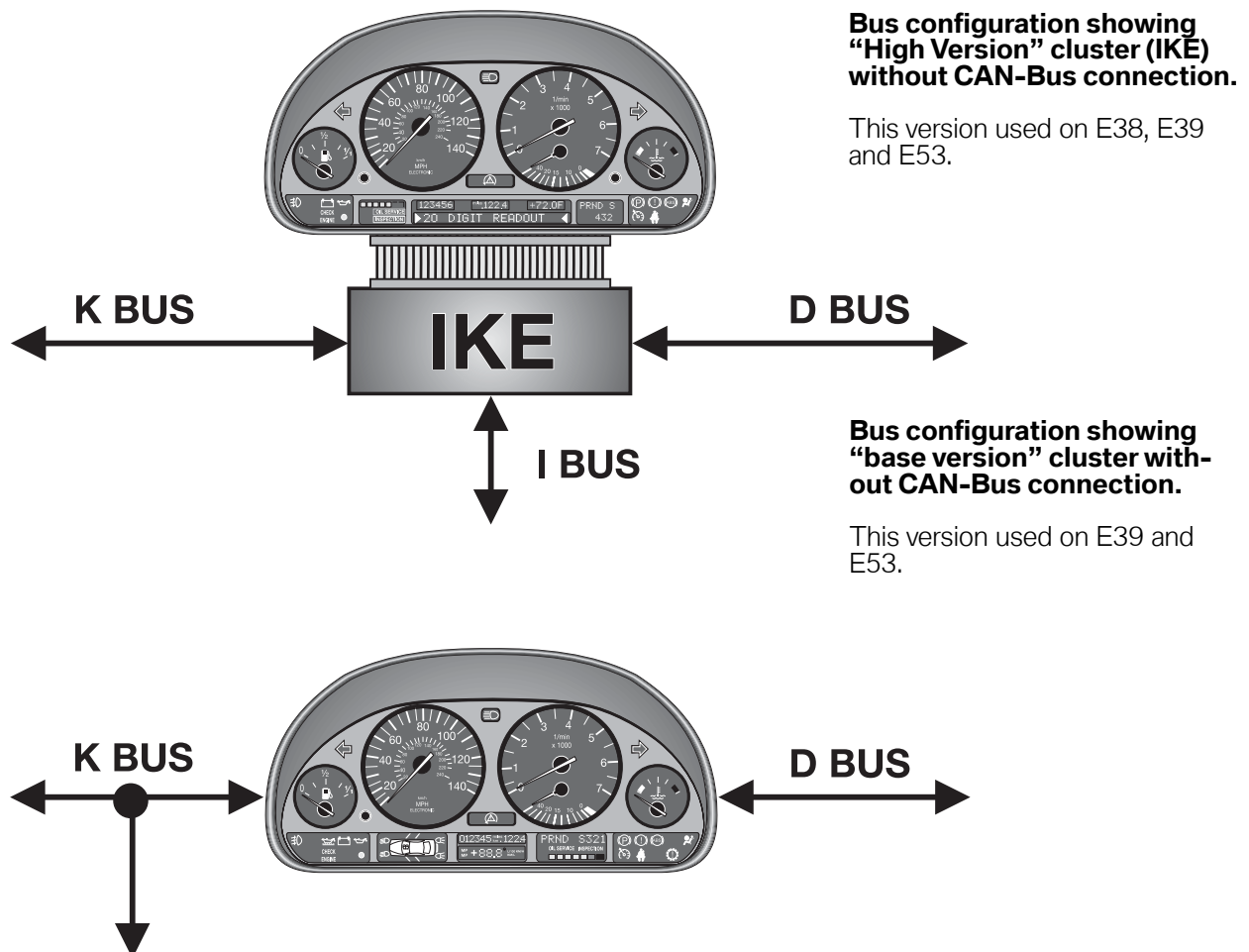
## Bus System Configuration

### I/K-Bus

I-Bus - which is used on the E38, E39 with High Cluster and/or Navigation and the E53 with High Cluster and/or Navigation.

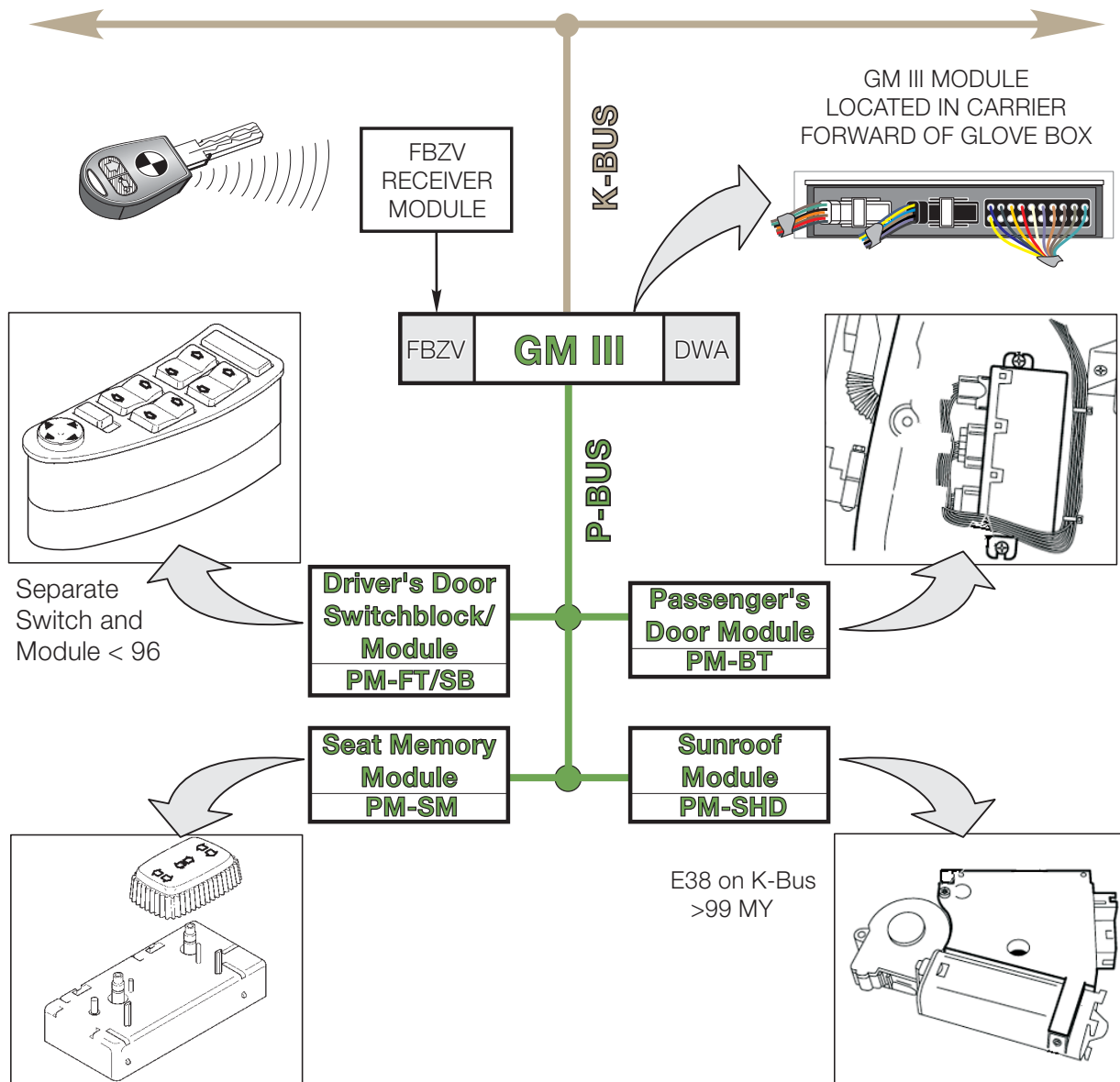
K-Bus - which is used on all vehicles (E38, E39 and E53) for communication with body electronic systems. On vehicles with the base cluster (Kombi), the K-Bus replaces the I-Bus functions.

The I and K-Bus are mostly identical in operation, the only difference is their use by model. The wire colors are different as well. They use the same voltage levels and communication protocols.



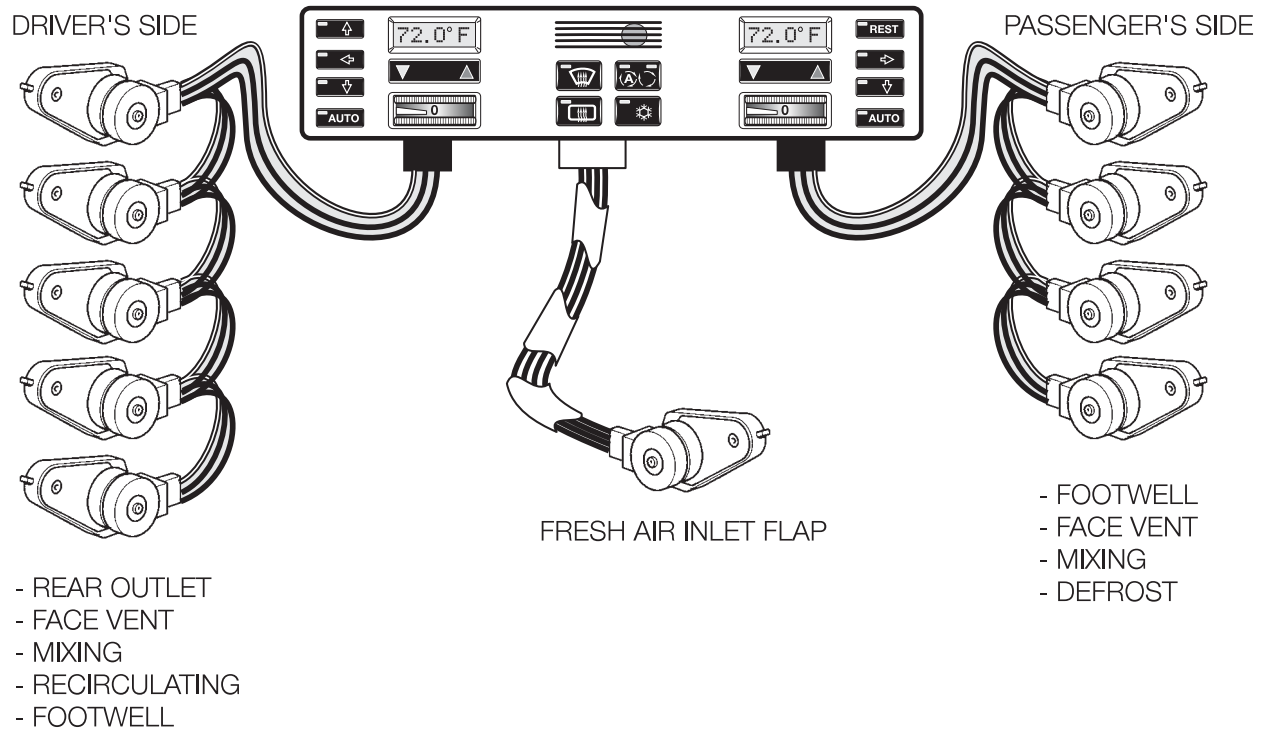
## Peripheral Bus

The P-Bus is exclusive to vehicle equipped with ZKE III (E38, E39 and E53). The P-Bus is controlled by the General Module (GM III) and provides communication with various peripheral module such as Driver's Door Switch Block Module, Passenger Door Module, Sunroof Module and the Seat Memory Module.



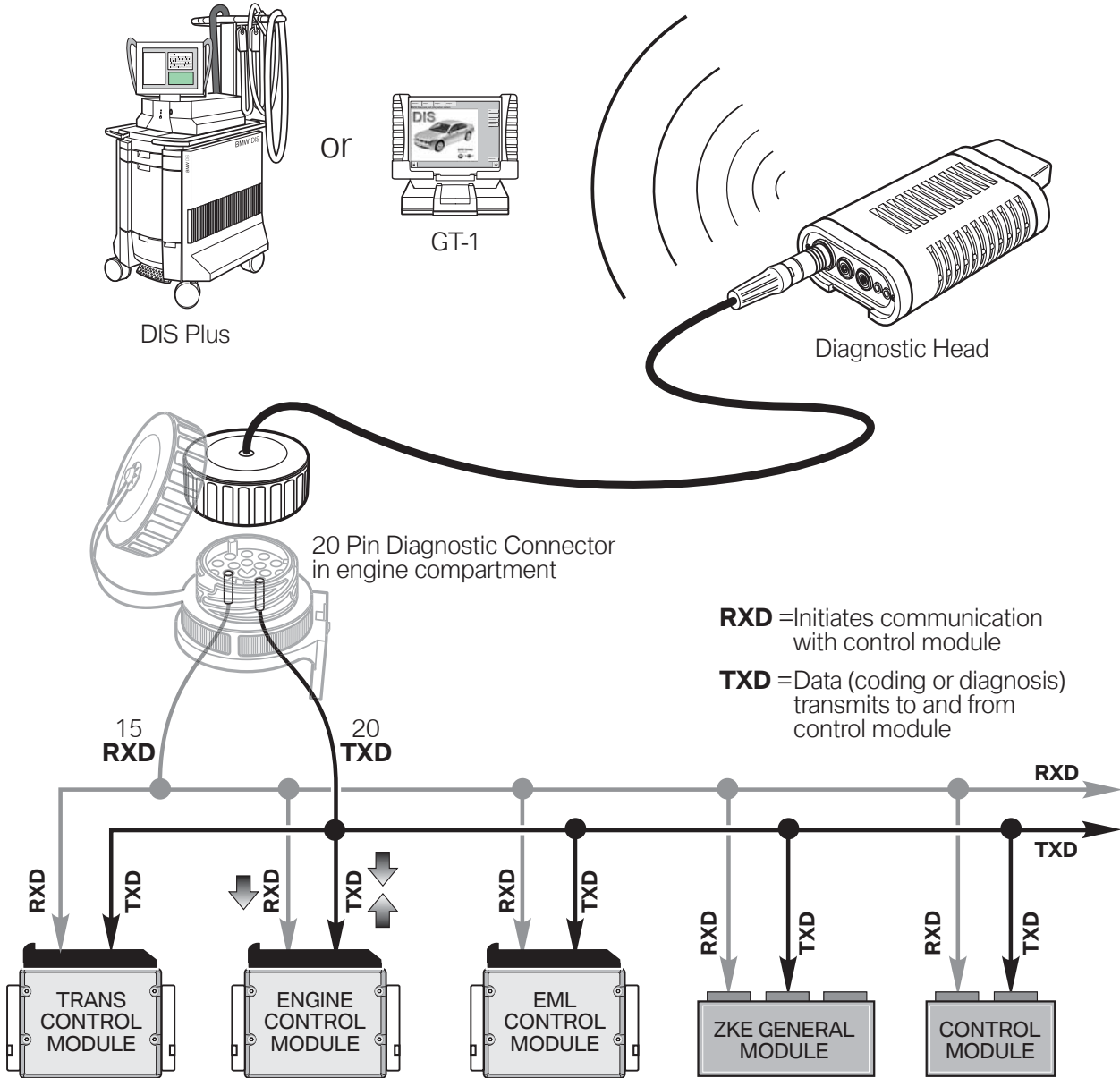
## Motor Bus

The M-Bus is used exclusively for the climate control systems (IHKA/IHKR) to operate the “smart” stepper motors which regulate various air control doors (defrost, fresh air, face vent etc.)



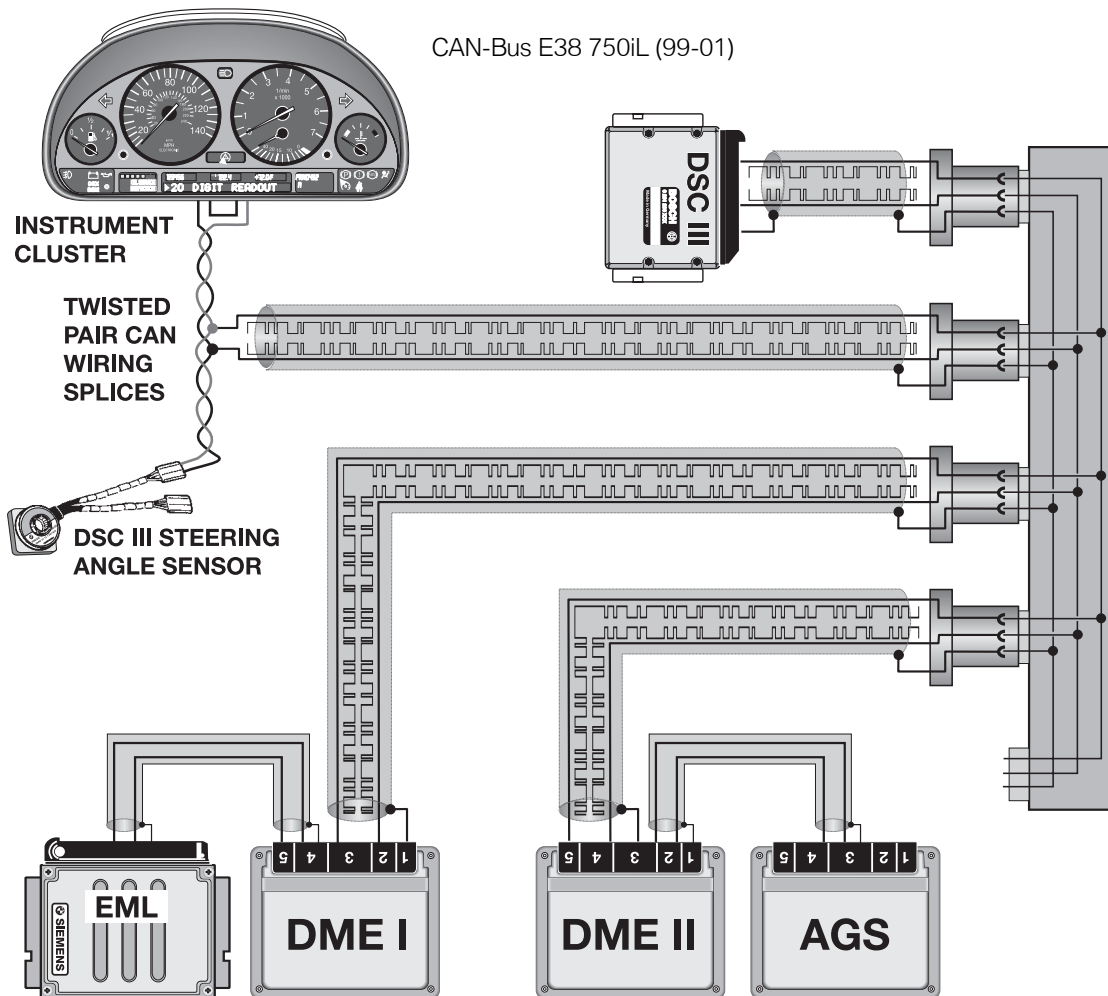
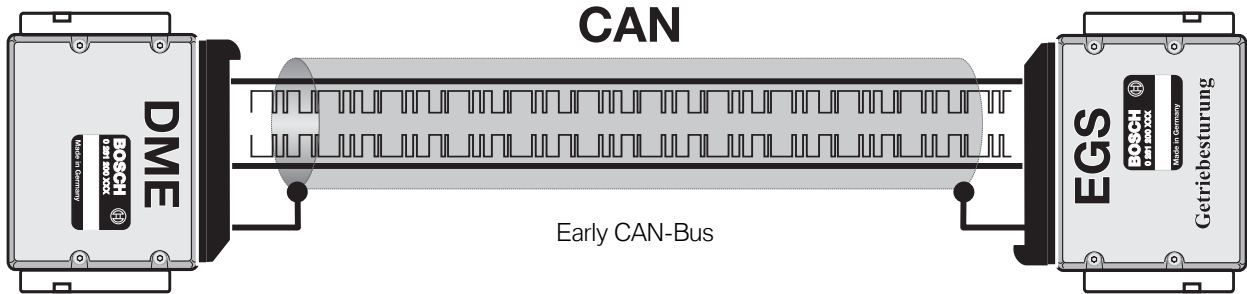
## Diagnosis Bus

Diagnostic communication take place over the D-Bus (TXD/RXD). The D-Bus is connect- ed directly to some modules or through a gateway such as the Kombi/IKE.



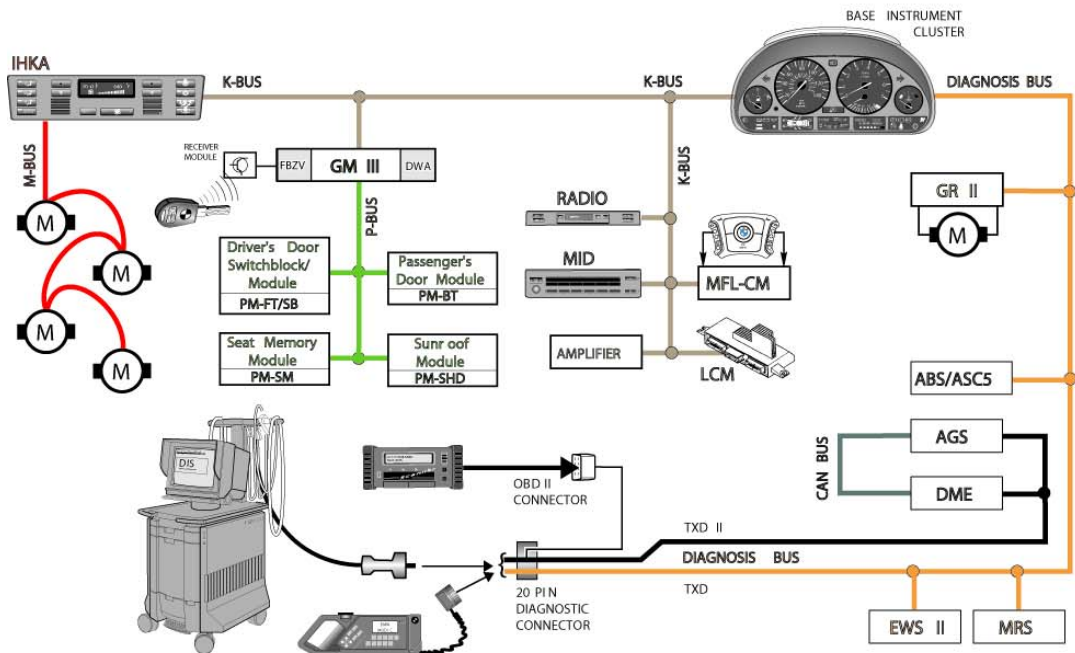
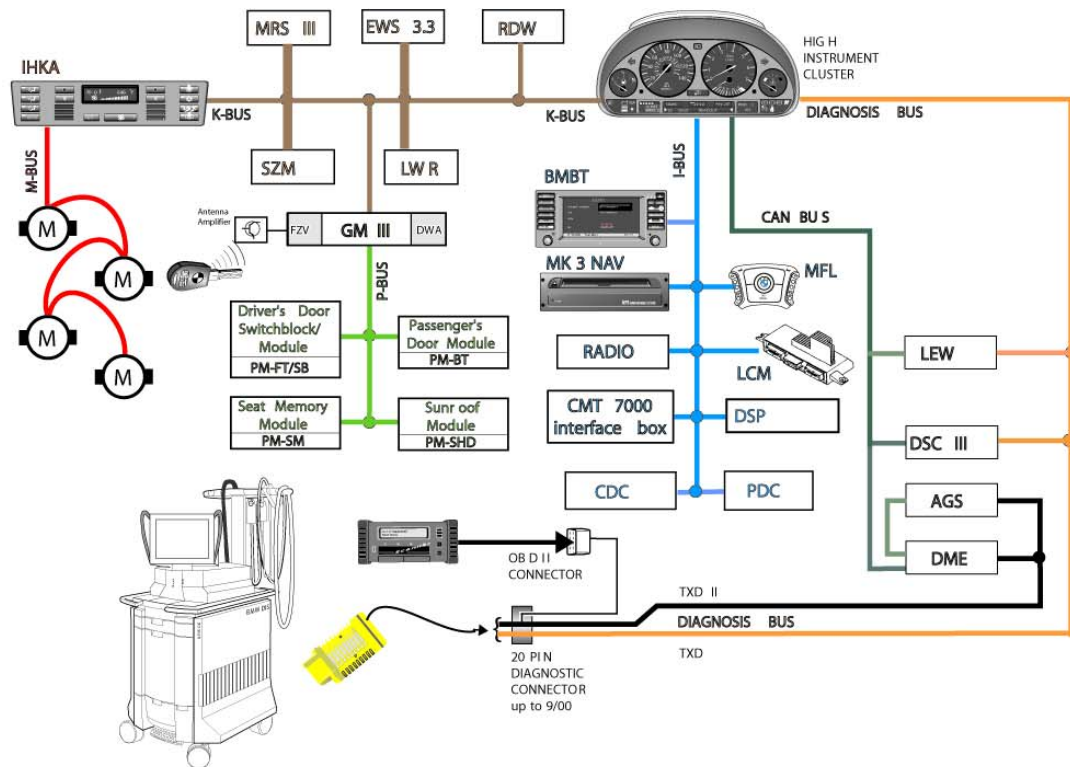
## Controller Area Network

The CAN-Bus was initially introduced as a network between the ECM (DME) and the Transmission Control Module. Beginning with the 99 model year, CAN was expanded to other modules including the instrument cluster.



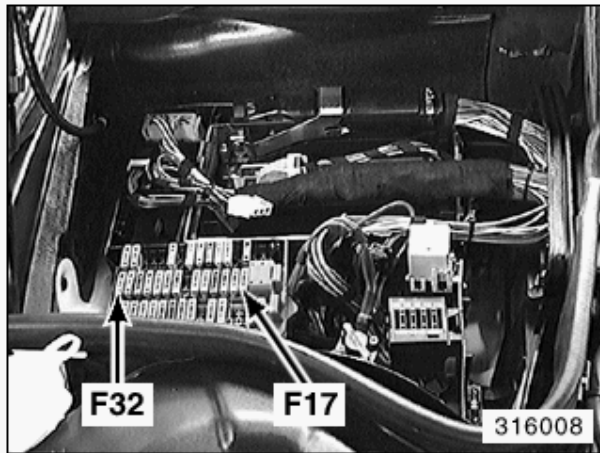


# Bus System Overview

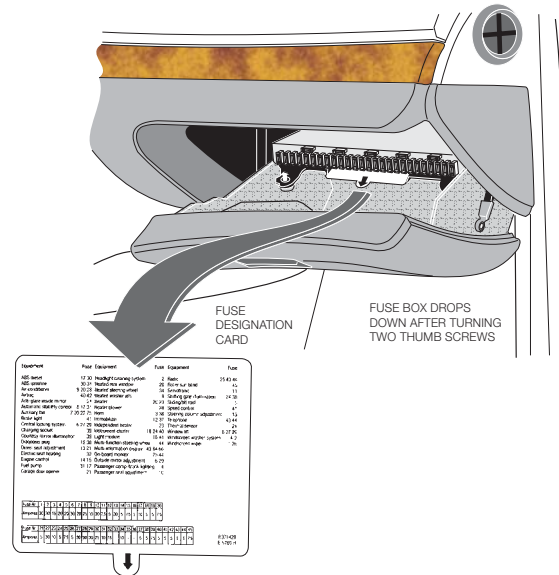


# Power Supply

The power distribution box for the E38 is incorporated in the Electronics box in the engine compartment. The power distribution box for the E39 and E53 is inside the vehicle.



E38 Power Distribution (in E-Box)



E39/E53 Power Distribution (in glove box)

The main fuse box is located inside the glove box above a hinged panel.

A “pull out” fuse designation card is also located in the fusebox. This notes:

- Fuse value in amps
- Location
- Circuit listing by fuse

Equipment	Fuse	Equipment	Fuse	Equipment	Fuse
ABS diesel	17 30	Headlight cleaning system	2	Radio	25 43 44
ABS gasoline	30 31	Heated rear window	20	Roller sun blind	45
Air conditioner	9 20 28	Heated steering wheel	34	Servotronic	11
Airbag	40 42	Heated washer jets	9	Shifting gate illumination	24 38
Anti-glare inside mirror	21	Heater	20 23	Sliding/tilt roof	5
Automatic stability control	8 17 31	Heater blower	28	Speed control	41
Auxiliary fan	7 20 22 75	Horn	3 38	Steering column adjustment	13
Brake light	41	Immobilizer	12 37	Telephone	43 44
Central locking system	6 27 29	Independent heater	23	Thermal sensor	21
Charging socket	39	Instrument cluster	18 24 40	Window lift	6 27 29
Courtesy mirror illumination	39	Light module	16 41	Windscreen washer system	4 2
Diagnosis plug	15 38	Multi-function steering wheel	44	Windscreen wiper	1 26
Driver seat adjustment	13 21	Multi-information display	43 64 66		
Electric seat heating	32	On-board monitor	25 44		
Engine control	14 15	Outside mirror adjustment	6 29		
Fuel pump	31 17	Passenger comp./trunk lighting	4		
Garage door opener	21	Passenger seat adjustment	10		

Fuse Nr.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Amperes	30	15	20	30	20	25	15	30	7,5	5	30	5	7,5	5	10	5	5	7,5		

Fuse Nr.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Amperes	5	30	10	5	7,5	5	30	30	30	25	10	15	-	10	-	-	5	5	7,5	5	5	5	5	5	7,5

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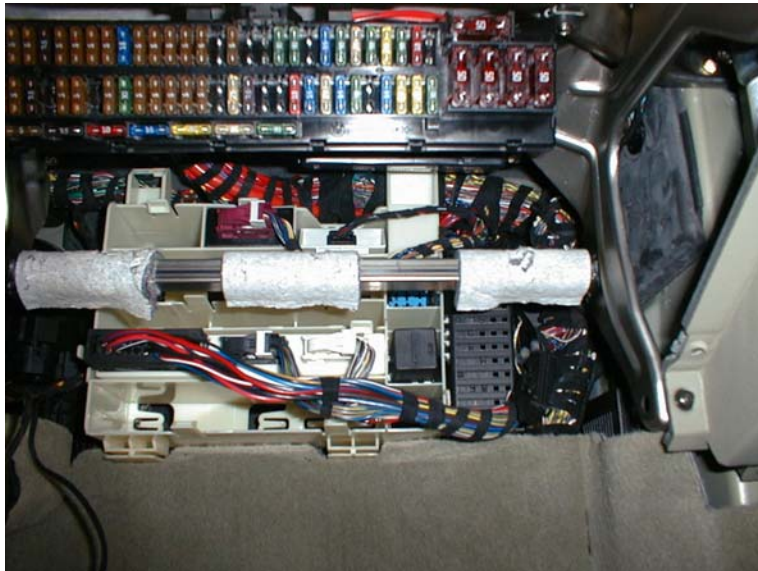
The placement of the power distribution box is close to the main electronics carrier behind the glove box. The modules/relays located in the electronics carrier are dependent upon model, year and optional equipment. Examples of these modules include:

- General Module III (GM III)
- Drive away protection (EWS II)
- Anti-lock Brake (ABS/ASC+T and early DSC 5.3 up to 99 MY)
- Light Check Module (LCM) - behind right kick panel
- Overload protection relay module
- LWR Module
- EDC Module (E38)

Some of the relays found behind the glove box include:

- K4 Blower Relay
- K9 Unloader Relay
- K72 Closed Circuit Cut-off Relay
- K131 Visual Entry Aid Relay

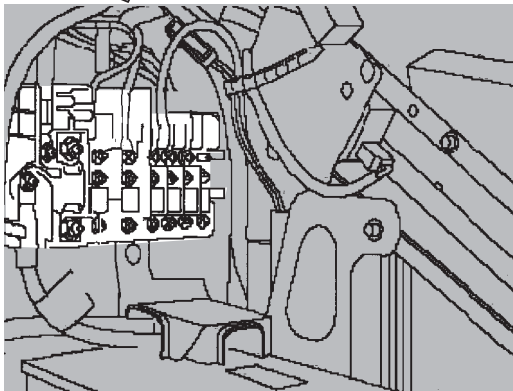
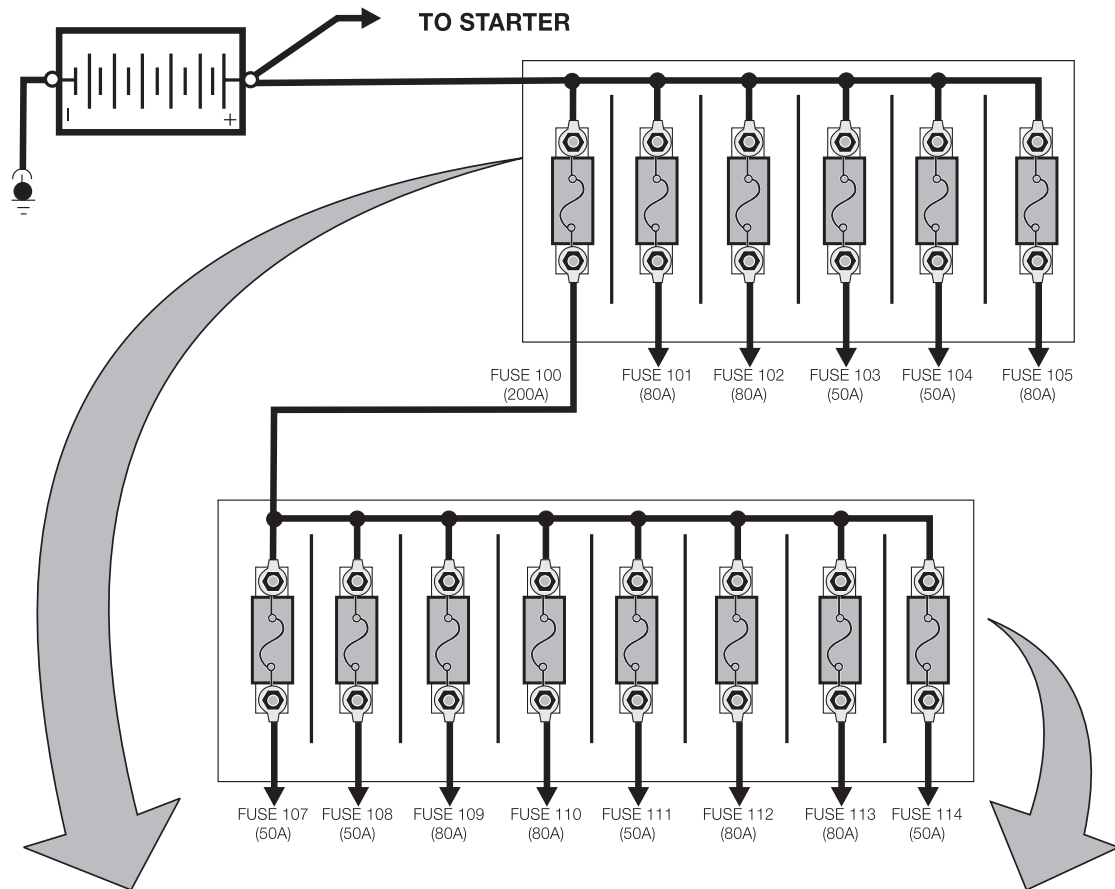
**Electronics Carrier behind glove box**  
(E53 example shown with glove box removed)



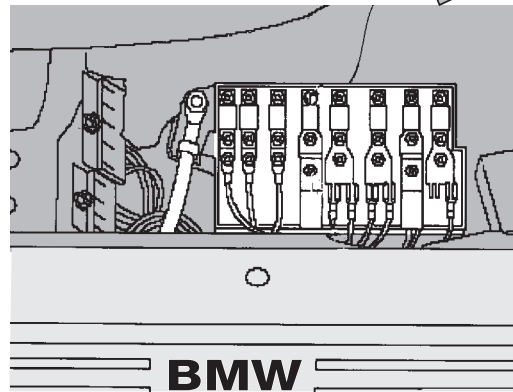
**Note: Always refer to the latest ETM (or WDS) for the correct component locations.**

## Fused Power Distribution Centers

The E38, E39 and E53 utilize high amperage fused power distribution centers.



**REAR FUSED POWER  
DISTRIBUTION CENTER**

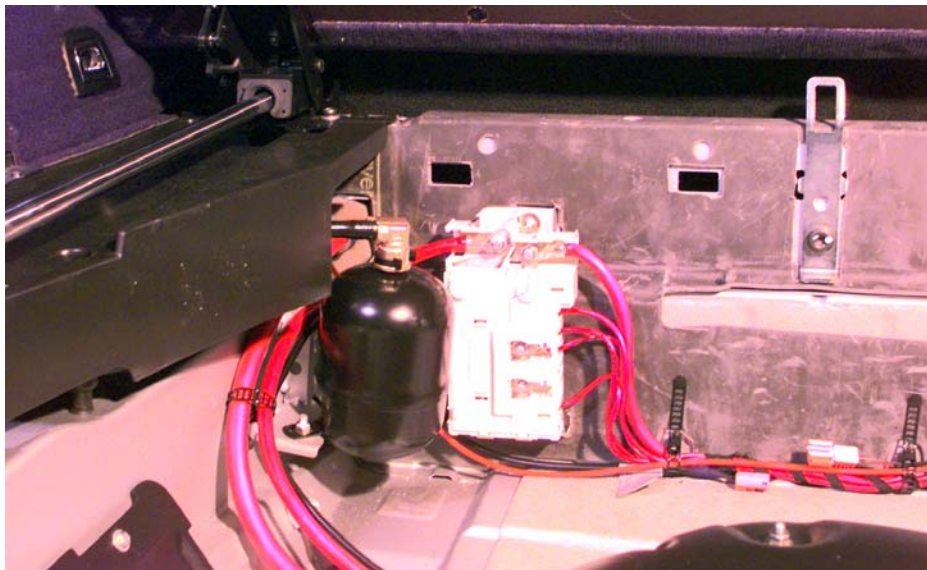


**FRONT FUSED POWER  
DISTRIBUTION CENTER**

The E38 and E39 locations are found under the carpet on the passenger's side floor in the sill area and in the right rear area of the trunk, forward of the battery.

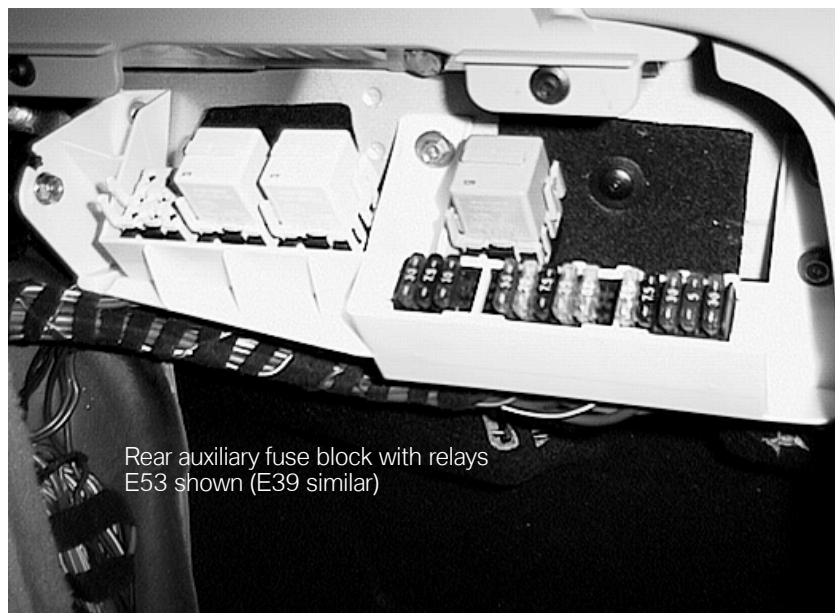
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The X5 utilizes a single high amperage fused power distribution center located next to the left side EHC air reservoir beneath the cargo area floor paneling.



An auxiliary fuse block is located in the trunk above the battery. In addition to fuses, the auxiliary fuse block also contains relays (examples):

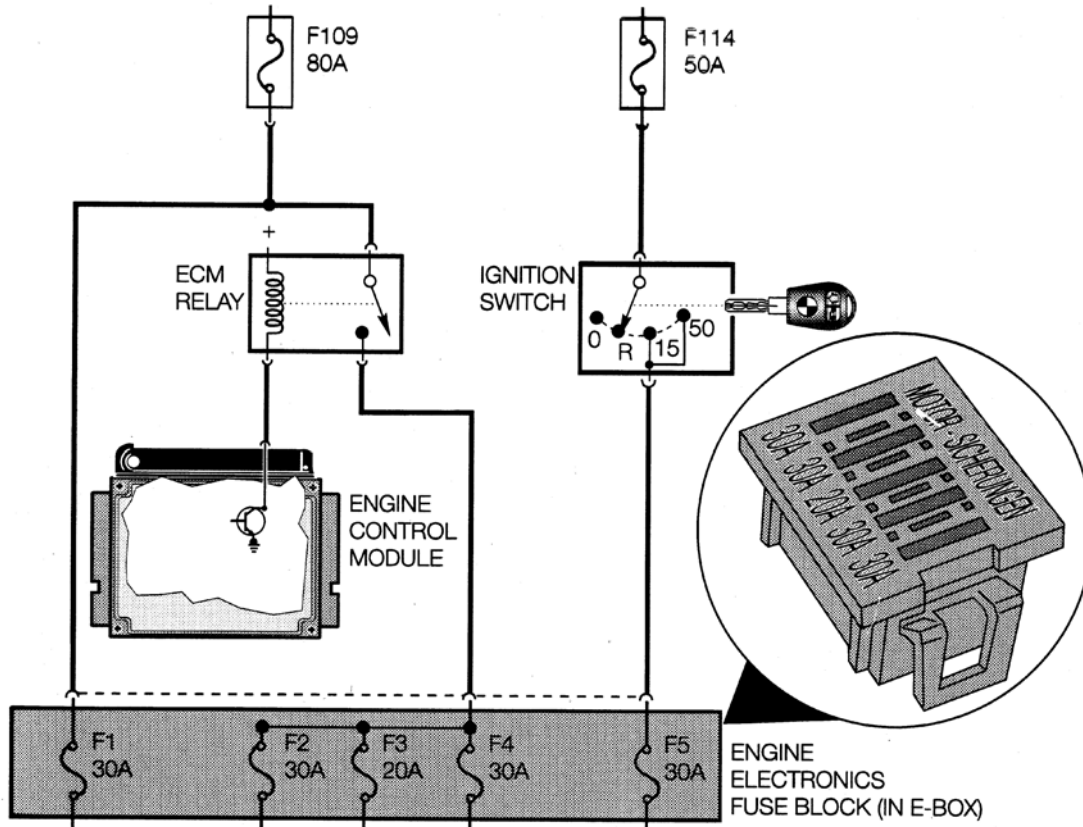
- Fuel filler flap lock motor relay
- Fuel pump relay (some vehicles)
- Rear defroster relay
- Unloader relay



Rear auxiliary fuse block with relays  
E53 shown (E39 similar)

## Fuses for Engine Electronics

Located in the E-Box, a small fuse carrier contains 5 fuses for engine electronics. These fuses are designated F1 through F5. These are not to be confused with the fuses for the body electronics systems which use the same numerical designation (F1-F5).

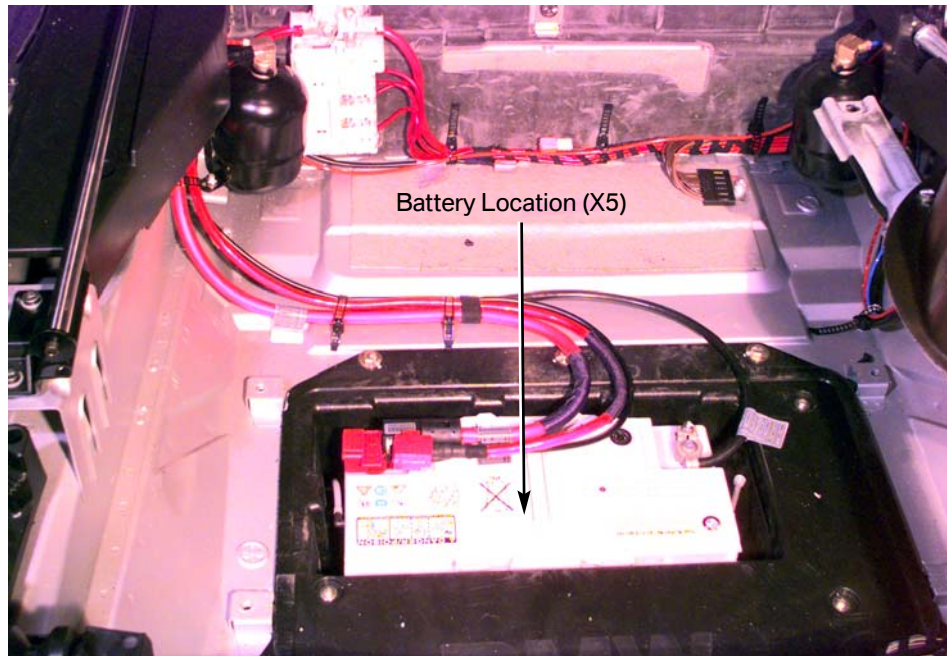


These fuses supply power to systems related to engine electronics such as:

- Fuel Injectors
- Engine Control Module (DME)
- Transmission Control Module EGS)
- Heated Oxygen Sensors
- VANOS Solenoids
- Camshaft Sensors
- Hot-Film Air Mass Meter
- Electronically (Map) Controlled Thermostat

## Battery

The battery is installed in the luggage compartment area on modern BMW vehicles. This provides protection from the elements. This location also allows for optimum weight distribution and contributes to the overall vehicle handling capability.



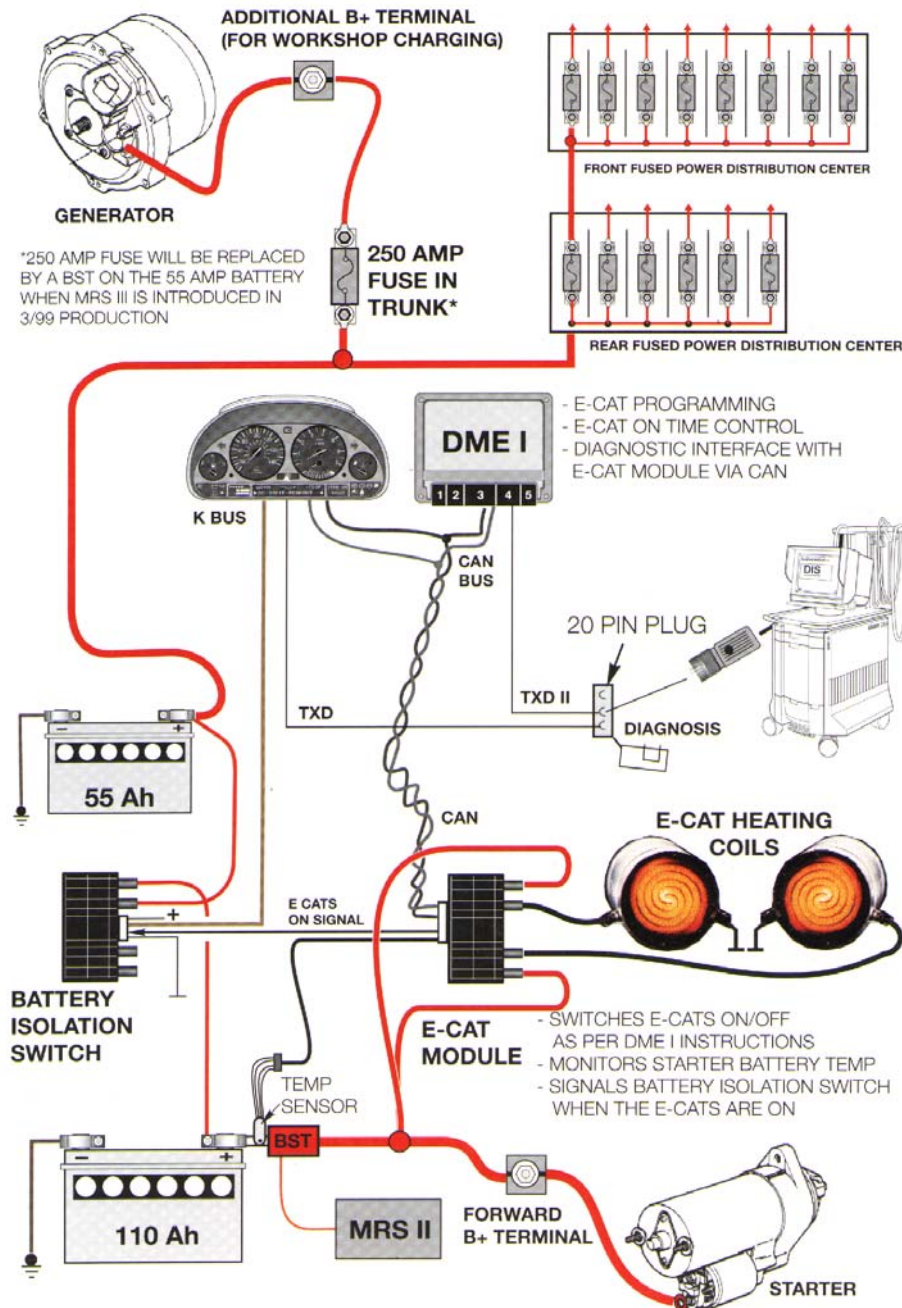
The battery locations are as follows:

- E38 - right side of luggage compartment.
- E38 750iL (99-01 with dual battery system) - 110Ah Battery in right side of luggage compartment, 75Ah battery located in bracket above.
- E39 - right side of luggage compartment.
- E39 Sportwagon - right side of luggage compartment behind subwoofer.
- E53 - below spare tire in luggage compartment in battery box.

## Dual Battery System (E38 750iL)

In order to comply with emission regulations in 1999, the E38 750iL (M73TU) utilizes an electrically heated catalytic converter. This system configuration required modification to the electrical system to meet the increased electrical load during startup.

This necessitated the installation of a dual battery system which allows the vehicle electrical system to be unaffected by the current requirements of the E-CAT system.

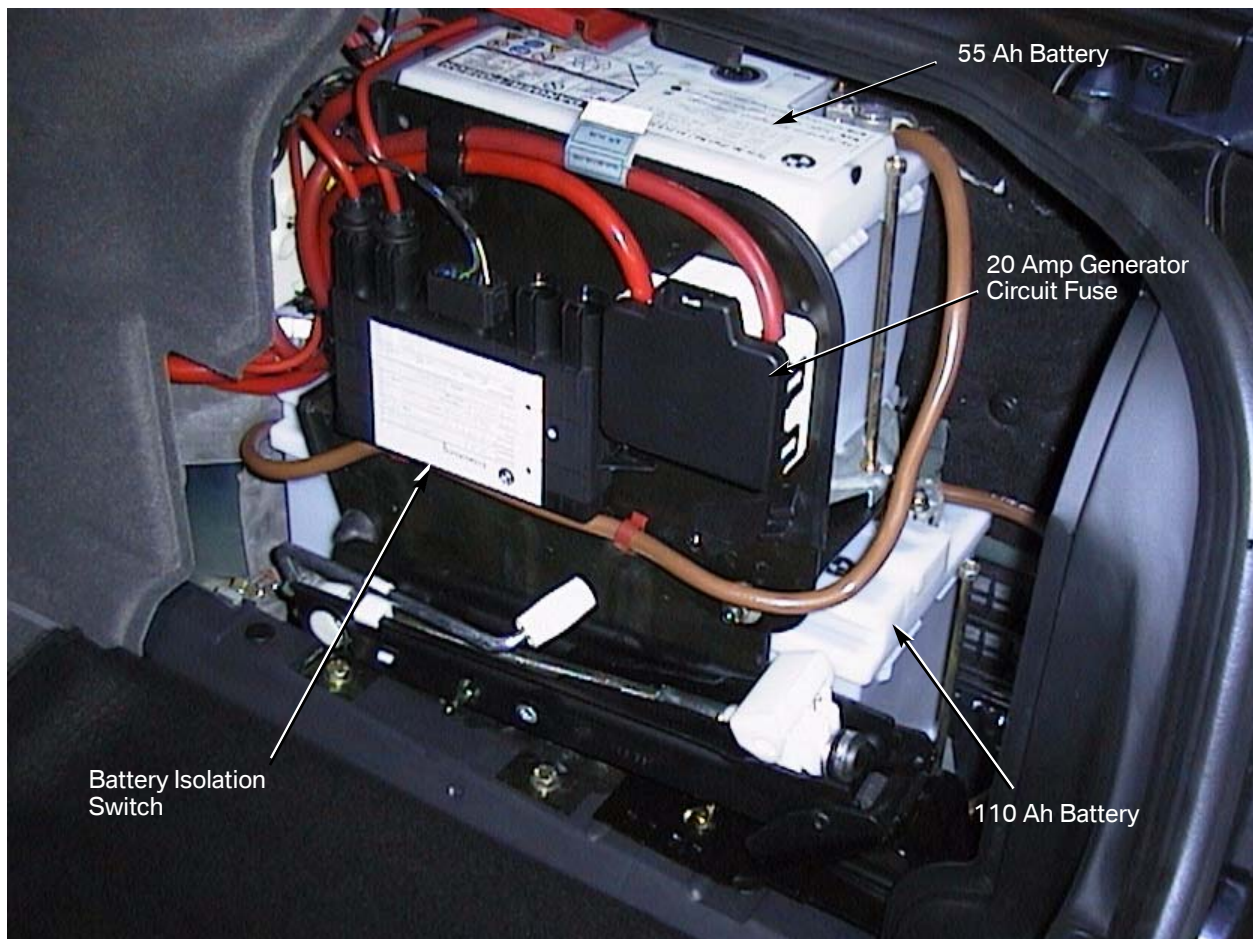




The dual battery system works in conjunction with the E-CAT system and is controlled based on commands from the ECM (DME).

The dual battery system consists of a starter battery (110Ah) which is used for starting and E-CAT operation. The second battery (55Ah) is located on a bracket above the starter battery. It provides the operating power for the vehicle electrical system.

The batteries are connected by an electronically controlled battery isolation switch. The battery switch opens and closes the circuit between both batteries as needed based on monitored conditions.



The battery isolation switch is not used to boost a discharged starter battery with the voltage of the vehicle circuit battery to start the engine.

**Note: The battery isolation switch can only withstand a maximum current flow of 60 Amps.**